Building NOAA's Environmental Real-time Observation Network

Site Survey Instructions

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U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Climatic Data Center

Signature/Approval Page

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Table of Contents

Background

Most countries have station networks that observe atmospheric variables in support of the WMO World Weather Watch Global Climate Observing System, or GCOS (WMO, 1988, 1989). In the United States, many federal agencies have observing systems that monitor weather or climate for specialized (mostly non-climate change) purposes (National Research Council [NRC], 1999). Examples include the National Science Foundations (NSF) Long-Term Ecological Research (LTER) network, the USDA Soil Climate and Analysis Network (SCAN) and snow pack telemetry (SNOTEL) network, the National Oceanic and Atmospheric Administration's (NOAA) Global Positioning Satellite-Integrated Precipitable Water (GPC-IPW) network, and the National Weather Service (NWS) upper-air, Automated Surface Observing System (ASOS), and Cooperative Observer (COOP) networks. Of these, the COOP network is best suited for climate monitoring and near real time weather data due to the geographic distribution.

The modernization of NOAA's Cooperative Observer Network as NOAA's Environmental Real-time Observation Network (NERON) is long over-due, partially because societal demands have changed greatly since the COOP network was launched ~115 years ago.

NOAA's Environmental Real-time Observation Network is a cooperative effort and matrixed with three line offices that include, NESDIS, NWS, and the NOAA Office of Atmospheric Research (OAR). The goal is to:

- stabilize the existing observational capability;
- identify critical variables that are inadequately measured;
- build weather and climate observing requirements into the operational programs as a high priority; and
- establish a funded activity for the development, implementation, and operation of a NOAA Integrated Surface Observing System (ISOS).

To accomplish these goals, the NRC emphasized that a joint effort of U.S. departments and agencies is needed and that the program must strengthen and revitalize federal and state partnerships.

The NOAA response to the NRC concerns is the NERON. Data from the NERON will be used in near-real time weather and climate monitoring activities. The NERON will also provide the nation with an ISOS that meets the requirements for both weather and climate.

The guidelines in this document for site surveys, categorization and selection are intended to address the issues referenced above because *good siting is the foundation for reliable data*. Accordingly, selecting COOP sites appropriate for automation (hence, modernization) is *the most complex and critically important issue that NERON will face*. There simply are no methods that can correct data obtained from poorly exposed sensors.

Even so, a continual balance must be achieved between competing priorities to:

- protect the long-term climate record;
- keep the human observer in the modernized system;
- correct the problem at legacy sites which have grown to have unacceptably poor exposures; and
- acquire new sites that can grow to host more sensors and access modern, two-way telecommunications systems.

This document is intended to assist the Regional Site Selection Teams formed as an important component of the modernization process and their on-site surveyors such that *consistent site selections* are made as NERON spreads across the Nation.

Vision for NERON

Be a modern network that can *serve the nation as the backbone of the NOAA Integrated Surface Observing System (ISOS) and the sustaining factor around which all surface environmental monitoring networks are integrated* to save lives, enhance national security, protect property, support transportation, energy and agriculture, and promote the economic well-being by providing the highest-quality possible of real-time weather, water, and climate information, and possibly air quality and biochemical hazard data

Goals for Site Selection

The most desirable landscape surrounding a proposed modernized site is an open area that is relatively large and flat with low vegetation so that the horizon can be viewed in an unobstructed manner in all directions except at low elevation angles above the horizon.

Objectives for Site Surveys and Site Selection

Objective One: To provide "ground truth," site-specific information on locations chosen to host NERON equipment.

Objective Two: Geocode Law Enforcement Telecommunications System (LETS) and NERON locations to determine their precise coordinates, allowing perfection of the LETS/NERON linkages. (LETS is a high-bandwidth network of ~400,000 terminals across the United States designed to serve law enforcement and public safety.)

Project Coordination

NWS Headquarters (HQ), The National Climate Data Center (NCDC), state climatologists, and region headquarters will jointly be on the survey team; however, the WFO/state climate office personnel leading the project within their respective county warning areas/states will be responsible for meeting the siting and selection criteria for NERON stations.

General Guidance

In general, locations that have long-term climate records and a measure of climate variability are of high value. Selected locations must provide representative real-time weather information and have siting exposure that is expandable to meet future needs. The site location should be representative of the climate of the region within a 15- to 25-km (10- to 15-mile) radius, and should not be heavily influenced by unique local topographic and mesoscale/microscale features/factors.

There must be a reasonably high probability that selected sites and surrounding areas will be relatively stable over many decades. The risk of encroachments over time and/or the chance the site will close due to the sale of the land or other factors must be minimized. Legacy stations or new stations located on institutions, small community airports, government (federal, state, local) land or at colleges (granted/deeded land with land use restrictions) often provide a higher stability factor.

Favorable Site Characteristics

The following is a list of site characteristics that should be sought out:

- + not heavily influenced by unique local topographic and mesoscale/microscale features/factors;
- + long-term stability of the site and surrounding area;
- + large open area that is free of obstructions;
- + slight ground slope, to allow drainage and sampling of a larger volume of air;
- + thick vegetation cover that will not grow so high that it obstructs flow to the air temperature, relative humidity, dew point, or water vapor sensors or adversely affects wind measurements;

Site Characteristics for a Small Sample of Sites

The following is a list of site characteristics that should be chosen for a few sites in an area if those characteristics are significant for that area:

- cold pockets (there should be just enough sites chosen to determine if cold pocket properties change differently through the decades than for other sites); or
- ridge tops (these provide better exposure for temperature than for precipitation).

Site Characteristics to Avoid

The following is a list of site characteristics to be avoided, unless they are representative of the region or there are valid reasons acknowledged by the site selection team for installing in such areas:

- × adjacent to irrigated areas (should be avoided in all circumstances);

- adjacent to changing land surface conditions (e.g., cropping/fallowing cycles, irrigation cycles that change from year to year; if unavoidable, land of this type should be a minimum of 90 meters [300 feet] from the site);
- adjacent to artificial heating sources;
- young trees within ~50 meters of the site, unless site host will keep them cut back;
- large ground slope;
- flood plains (low areas adjacent to river basins, estuaries, and coastal offshore barrier islands/beaches), unless representative of the region and the station is sited in an elevated location and a few hundred feet to a kilometer from coasts;
- enclosed locations that may "trap" air and create unusually high incidents of fog, cold air advection;
- complex meteorological zones, such as those adjacent to large bodies of water; or
- areas subject to prolonged periods with extreme snow depths (e.g., several meters/tens of feet).

The size and type of fence that might be required will be site dependent. The site surveyor and the representative for the host organization must make a decision on this issue. Note any fencing requirements on the NERON Site Survey Metadata Form.

In many cases, the instrument suite will be in a relatively "secure" location. It is not possible to deter the determined trespasser, so no fence arrangement can be completely adequate. The objective of a fence is to provide a physical barrier, which makes a statement: please do not come closer or touch the equipment.

The installation sequence at sites not already installed will depend on scheduling and will be conducted by the contractor.

Site information is to be delivered to the NERON Program Office and the WFO who will negotiate the final WS Form B-30 with the site, if a NOAA-owned site. The General Counsel at the U.S. Department of Commerce (DoC) has approved a generic NWS Form B-30. Modifications must be made to include power sharing or NWS reimbursement of the costs for power when an agreement is made to use AC power at a site.

Local Site Representativeness Evaluation (Classification Scheme)

Local environmental and nearby terrain factors have an influence on the *quality* of a measurement. The selection of an instrument site will be the result of a balance between competing demands, such as those highlighted in the prioritized list of site-selection criteria below, and an assessment of the *quality of measurements* guidelines outlined below.

The most desirable local surrounding landscape is a relatively large and flat open area with low local vegetation in order that the sky view is unobstructed in all directions except at the lower angles of altitude above the horizon. No significant obstruction within 300 meters of the instrument suite.

There will be many sites that are less than ideal. Selecting a site is a series of compromises between a number of factors. The NERON/COOP Modernization will use the classification scheme below to document the *meteorological measurements representativity* at each site. This scheme, which is used by the U.S. Climate Reference Network, is based on that described by Michel Leroy (1998) and used by Meteo-France to classify their network of approximately 550 stations,. The classification ranges from 1 to 5 for each measured parameter. The errors for the different classes are estimated values.

Classification for Temperature and Humidity

Class 1 – White: Flat and horizontal ground surrounded by a clear surface with a slope below 1/3 (<19 degrees). Grass/low vegetation ground cover < 10 cm high. Sensors located at least 100 meters (m) from artificial heating or reflecting surfaces, such as buildings, concrete surfaces, and parking lots. Far from large bodies of water, except if it is representative of the area, and then located at least 100 m away. No shading when the sun elevation >3 degrees.

Class 2 – Green: Same as Class 1 with the following differences. Surrounding Vegetation < 25 cm. No artificial heating sources within 30m. No shading for a sun elevation > 5 degrees.

Class 3 – Blue: (anomaly = 1°C): Same as Class 2, except no artificial heating sources within 10 m.

Class 4 – Yellow: (anomaly ≥ 2°C): Artificial heating sources < 10 m.

Class 5 – Red: (anomaly ≥ 5°C): Temperature sensor located next to/above an artificial heating source, such a building, roof top, parking lot, or concrete surface.

Classification for Precipitation

One factor to consider is an area surrounded by uniform obstacles of about the same height. Wind speed is a significant factor that affects the accuracy of measuring liquid and frozen precipitation. A wind shield can be placed around the gauge to improve the accuracy of the "catch."

Class 1 – White: Flat horizontal ground surround by a cleared surface with a slope below 1/3 (< 19 degrees). Any obstacle must be located at a distance of at least 4 times the height of the obstacle. An obstacle is an object seen from the precipitation gauge with an angular width of ≥ 10 degrees.

Class 2 – Green: (error 5%): Same as Class 1, except an obstacle is located at a distance of at least two (2) times its height.

Class 3 – Blue: (error 10% to 20%): Ground with a slope below 1/2 (< 30 degrees). Any obstacle is located at a distance of at least its height.

Class 4 – Yellow: (error > 20%): Ground with a slope > 30 degrees. Obstacles located at a distance less than their height.

Class 5 – Red: (error > 50%): Obstacles overhanging the gauge.

Classification for Wind

Defined for a wind sensor at a height of 10 m.

Class 1 – White: Sensor located at a distance of at least ten (10) times the height of the obstacle (elevation angle < 5.7 degrees). Object considered an obstacle if seen at angular width > 10 degrees. Obstacle is below 5.5 m height within a 150 m radius and 7 m within a 300 m radius. Wind sensor located a minimum distance of 15 times the width of thin (angular width < 10 degrees) nearby obstacles (i.e., mast, tree). Surrounding terrain relief change ≤ 5 m within a 300 m radius.

Class 2 – Green: (error 10%): Same as Class 1 except terrain change ≤ 5 m within a 100 m radius.

Class 3 – Blue: (error 20%): Same as Class 1 except no obstacles within five times the height of the nearby obstacles (elevation angle < 11.3 degrees). Wind sensor located a minimum distance of 10 times the width of thin nearby obstacles. Terrain change ≤ 1 m within a 10 m radius.

Class 4 – Yellow: (error 30%): Same as Class 3 except no obstacles within 2.5 times the height of the nearby obstacles (elevation angle < 21.8 degrees).

Class 5 – Red: (error > 40%): Obstacles within 2.5 times the height of the nearby obstacles.

Prioritized List of Site-Selection Criteria (High to Low)

1. High-quality siting and exposure meeting climate principles

2. Long-term stability of the instrument sites—low risk of being asked to leave the location during the next 50 years and low risk of significant changes to the surrounding area

3. Microscale features in the nearby landscape must not dominate the synoptic and mesoscale climate signals

4. NERON sites where access to a LETS hub may be attained. New sites established to improve the LETS/NERON linkage could include sites established on the tops of strategically-located mountain ridges or at LETS agencies deemed to have White or Green exposures.

5. Year-round access for maintenance visits (scheduled or unscheduled)

6. Nearby access to AC power (the distance between an AC source and the instrument site should be as short as possible, typically less than 300 feet; solar power is an option if AC power is not available)

7. Legacy COOP sites with sensor exposures that are Blue or better *and* meet specific, identifiable needs of the local NWS weather forecast offices (WFOs) and river forecast centers (RFCs).

8. Legacy COOP sites with sensor exposures that are Blue or better *and* are part of the hourly precipitation data network (HPD).

9. Legacy COOP sites with sensor exposures that are Blue or better *and* are part of the historical climate network (HCN).

10. New sites that fulfill a spatial void *and* have a site exposure rated White or Green. New site examples include small community or sub-regional airports, agricultural research farms, etc.

Deliverables

For each NERON and LETS location, coordinates (latitudes and longitudes to 5 decimal places) will be collected using GPS technology and digital photographs will be acquired around the location. For each NERON location, the site suitability for NERON equipment will be assessed; for each LETS site, the opportunity for a LETS linkage will be evaluated. The outcome will be a collection of site descriptions for the LETS towers and locations chosen to receive NERON equipment.

Survey Tasks and Guidelines

The following tasks and guidelines are for field surveys of proposed/potential NERON sites and to determine the location of nearby LETS agencies:

1. Using knowledge of their respective county warning areas and the Legacy COOP program, WFOs and state climate offices will identify potential sites as candidate sites for NERON. Obviously, some spatial limitations will apply; thus, common sense must prevail. The WFOs/state climate offices are encouraged to conduct on-site visual surveys prior to identifying candidate sites. If this is not possible, the external site-survey team will conduct an extensive on-site evaluation during its site visit. The site surveyor must complete the NERON Site Survey Metadata Form, found in the appendix, during each site inspection.

2. Using instructions provided by the National Weather Service, provide site surveys of NERON sites that have been proposed for modernization/automation or NOAA partner sites that have been proposed for inclusion in NERON.

3. Coordinate these surveys with the appropriate WFO [either the Meteorologist in Charge (MIC) or the Data Acquisition Program Manager (DAPM) or both]/state climate office. A list of contact names and phone numbers will be provided. Visit with each DAPM/state climatologist to fine-tune the protocol for visiting potential NERON sites.

4. Work in harmony with the local WFO/state climate office to notify each landowner at least a day or two before a proposed visit. (The WFO/state climate office likely will make the initial contact).

5. Spend several days in training on the *best practices* for conducting site surveys. Discuss and refine the techniques for conducting these surveys. Learn from examples of *excellent siting* and from examples of *unacceptable siting*.

6. Receive training on the use of a GPS handheld device and work with the GIS team to understand the nature of the ground-truth information that is needed.

7. When questionable situations arise (e.g., a site proposed for modernization is judged to be in the Yellow or Red categories), contact either: Steven Pritchett at NWS HQ, Ken Crawford at the NWS ISOS Program Office in Norman, the COOP Program Manager at the NWS region headquarters responsible for the area, or the state climatologist.

8. When other *questions of intent* arise at sites judged to be Blue or better, contact the appropriate WFO/state climate office, as applicable, for clarifications.

9. In all situations, be very considerate and polite to the respective landowners.

10. Using instructions supplied in the site survey guidelines, all digital photographs and survey data are to be carefully labeled and documented.

11. Upload all images, notes, and files to the NERON FTP site at the end of each workday using high-speed Internet connections (e.g., at carefully chosen hotels) if at all possible. If high-speed Internet access is not available, then upload all files at the next opportunity, preferably within 5 business days.

12. Always wear identification credentials supplied by National Weather Service Headquarters or the state climate office. Show this information as you introduce yourself to each landowner. Be up-front and honest with the host organization. If a site that has not yet been installed, describe the physical instrument configuration, particularly the size and shape of the area in which the instrument suite will be located. Show a picture of the sensor suite.

13. Maintain frequent contact with your surveyor colleagues so that *lessons learned* are shared to benefit the total effort.

14. As survey information is loaded onto the NERON metadata web site, view the metadata information occasionally to ensure that no errors have crept into the rapidly evolving site selection database.

15. On a weekly basis, document all lessons learned to benefit NERON surveys that will follow in all other states.

Site Survey Procedures

The following sections explain the procedures for conducting the survey and filling out the

survey metadata form, line by line. The section headings below match both the section headings and the individual data entry numbering system used in the survey form. Explanations are provided only for the entries that might not be completely self-explanatory.

A. Site Physical location and contact information

A.2 SITE TYPE: Check LEGACY COOP SITE if an existing manual COOP station already exists at the surveyed location. Check EXISTING HCN SITE if a legacy COOP site that is part of the Historical Climate Network (HCN). Check NOAA PARTNER SITE if surveying a site that will be operated by a non-NOAA organization, such as a state mesonet. Check NEW SITE if there is not already a legacy COOP or NOAA partner site installed in the vicinity of the surveyed location.

A.3 SITE ID: If a new site, provide a 5-character alpha-numeric "pseudo name" until assigned a NWSLI COOP ID (e.g., the first site in Athens, GA surveyed will be "pseudo named" with the first 3 letters of the city followed by sequential numbering: ATH01, second Athens location: ATH02, first Macon GA site: MAC01, etc.). If a legacy COOP site, enter its NWSLI COOP ID. If an existing NOAA partner site, provide the station's existing ID. If the existing station has an ID that is too long to fit in the Site ID box, enter a pseudo name.

A.4 SITE NAME: If an existing site (including all legacy COOP sites), enter the site's full name.

A.5 NOAA PARTNER NAME: Enter the name of the NOAA partner organization, if a NOAA partner site (e.g., USGS, UGA, NPS, etc.).

A.7 SITE LOCATION INFORMATION

A.7.6 – A.7.8 LATITUDE, LONGITUDE, and ELEVATION: Note: It is very important that you record the latitude, longitude, and elevation where the instrument suite will be installed. Latitude and Longitude MUST be recorded in decimal degrees to 5 places to the right of the decimal – NO ROUNDING. THE SURVEY IS INVALID WITHOUT LAT/LON in DECIMAL DEGREES to 5 places to the right of the decimal and ELEVATION in FEET.

A.7.9 LAT/LON SOURCE: Enter the brand and model of the GPS used to acquire the latitude and longitude.

A.7.10 ELEV SOURCE: Enter "GPS" and the brand and model of the GPS used to acquire the elevation, if a GPS was used. If another method, such as a map or barometer is used, enter "map", "barometer", etc.

A.7.11, A.7.12 HORIZ/VERT COORDINATE REFERENCE DATUM: Enter the horizontal and vertical coordinate reference datums used by the GPS. The horizontal reference datum used must be NAD83 (North American Datum of 1983) or later, and the vertical reference datum used must be NAVD88 (North American Vertical Datum of 1988) or later. In many cases, the horizontal coordinate reference datum is used by the GPS as a single 3-dimensional coordinate reference datum for both horizontal and vertical data. In this case, enter that datum in both horizontal and vertical boxes. The datum used by the GPS can be set and/or determined by accessing its setup options. <u>It is important to note</u>

the datum used, because errors of up to 150 feet can be introduced by assuming the wrong datum.

A.7.13 WFO CWA ID: Enter the 3-letter identifier of the WFO in whose county warning area the site is located.

B. Physical Site Aspects and Photos

B.2 **Appointment made with host?** Make sure you have an appointment for surveying the site. The WFO/State Climate Office will have provided contact information and prior notification to the site if it is a legacy COOP/HCN site. NOAA partner site notification occurs through coordination first with the site host and/or contact. Call the site and identify yourself as a representative of the National Oceanic and Atmospheric Administration (NOAA) and State Climate Office and that you will be conducting a site survey for the purpose of possibly installing a weather and climate observing system.

B.3 **Pre-survey preparation complete?** Where available, get general site description and digital pictures, aerial photos, topographic maps. Read whatever information the WFO/state climatologist has provided you. Prepare your route!!! The following is a list of the sequence of events required to prepare for the survey:

1. WFO/state climatologist or NOAA partner contacts potential site host 1 to 3 weeks in advance of survey

2. Surveyor contacts potential host to set appointment within 1 week.

3. Obtain via phone/e-mail as much information on proposed properties as possible

4. Obtain latitude/longitude, digital photos of specific pieces of property, and, if available, aerial photos.

5. Determine physical condition of property and surrounding area.

6. Check maps at:
   http://topozone.com/
   http://www.mapquest.com/
   http://www.geographynetwork.com/
   http://www.terraserver.com/

B.4 **SITE PHOTOS:** Take many photos. Set the camera resolution at 1200 x 1600 pixels, or as close as the camera allows, but no lower. There are 13 mandatory pictures required from a survey at every site. If these 13 mandatory pictures are not taken and subsequently uploaded to the NERON web site as soon as possible (uploading is encouraged no more than 5 days after survey completion), the SURVEY is INVALID. Conditional photos are strongly encouraged and will aide in the selection of high quality NERON sites. Conditional photos include: panoramic approaches to the site, close up photos of nearby obstructions (e.g., buildings, trees, nearby bodies of water or tilled fields, parking lots, and fencing), pictures of site views of AC sources from the center of

the site plot, and any abrupt terrain changes. The NERON FTP site for uploading photos is located at:

ftp://isos.noaa.gov

Each user must use the username and password supplied by the NERON Program Office to ensure access to the correct directory in the FTP site. Create a new folder, named with the site ID, inside the "submitted_photos" directory in the directory corresponding to the state in which the site is located for each survey. Photo file naming conventions are included in the sections below and MUST be followed prior to uploading. The survey will be considered INVALID if the naming convention is not followed for at least the mandatory photos. All photo file names begin with the following prefix:

S_sitidyyyymmdd

S_ indicates a survey file
sitid = site ID or pseudo name
yyyy = year photo was taken
mm = month photo was taken
dd = day of the month photo was taken

The sections below list the remainder of the photo naming convention for each photo type.

Example: The following is an example of file names for photos submitted from a fictional survey of a site with ID "ATH02" on June 8, 2005:

Mandatory Photos
S_ATH0220050608SO_N.JPG – site outward-looking photo, looking north
S_ATH0220050608SO_NE.JPG – site outward-looking photo, looking northeast
S_ATH0220050608SO_E.JPG – site outward-looking photo, looking east
S_ATH0220050608SO_SE.JPG – site outward-looking photo, looking southeast
S_ATH0220050608SO_S.JPG – site outward-looking photo, looking south
S_ATH0220050608SO_SW.JPG – site outward-looking photo, looking southwest
S_ATH0220050608SO_W.JPG – site outward-looking photo, looking west
S_ATH0220050608SO_NW.JPG – site outward-looking photo, looking northwest
S_ATH0220050608SI_N.JPG – site inward-looking photo, looking north
S_ATH0220050608SI_E.JPG – site inward-looking photo, looking east
S_ATH0220050608SI_S.JPG – site inward-looking photo, looking south
S_ATH0220050608SI_W.JPG – site inward-looking photo, looking west
S_ATH0220050608SD.JPG – site downward photo

Conditional Photos
S_ATH0220050608OB_067.JPG – obstruction photo, looking toward 67°
S_ATH0220050608OB_193.JPG – obstruction photo, looking toward 193°
S_ATH0220050608AC_256.JPG – potential AC line photo, looking toward 256°

S_ATH0220050608SG_000.JPG – site ground cover photo, looking toward 0°
S_ATH0220050608SG_090.JPG – site ground cover photo, looking toward 90°
S_ATH0220050608SG_180.JPG – site ground cover photo, looking toward 180°
S_ATH0220050608SG_270.JPG – site ground cover photo, looking toward 270°

B.4.9 MANDATORY PHOTOS

B.4.9.1 **Site outward-looking photos:** Eight photos looking outward from the center of the proposed site plot. Standing in the center of the proposed site plot, take pictures (starting from north) looking out with the zoom set at the widest angle and the camera held in landscape (horizontal) orientation and proceed clockwise with a new photo every 45 degrees (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° True). Use a compass and the local magnetic deviation to aim the camera to within 1 degree of the specified direction, referenced to true north. Use the following file naming convention postfix:

…**SO_aa.JPG**

SO_ indicates a site outward-looking photo
aa = direction (azimuth) toward which photo was taken: N, NE, E, SE, S, SW, W, NW

B.4.9.2 **Site inward-looking photos:** Four photos looking inward at the proposed site at points 30 feet from the center of the proposed site plot. There should be a stake or similar device indicating the center of the site plot in the inward-looking photos. Take the first inward-looking photo looking into the site toward true North, then proceed clockwise and take a photo every 90 degrees (N,E,S,and W). Use a compass and the local magnetic deviation to aim the camera to within 1 degree of the specified direction, referenced to true north. Use the following file naming convention postfix:

…**SI_a.JPG**

SI_ indicates a site inward-looking photo
a = direction (azimuth) toward which photo was taken: N, E, S, W

B.4.9.3 **Site downward photo:** While standing at the stake at the center of the site plot facing toward the south take a photo looking down at the ground. Use the following file naming convention postfix:

…**SD.JPG**

SD indicates a site downward photo

B.4.10 CONDITIONAL PHOTOS

B.4.10.1 **Obstruction photos:** For obstructions at or closer than 300 meters from the site, take zoomed-in photos of the obstructions from the site plot. Use the following file naming convention postfix:

…**OB_aaa.JPG**

OB_ indicates an obstruction photo looking from the proposed site plot
aaa = direction (azimuth), referenced to true north, toward which photo was taken

to the nearest degree

B.4.10.2 Potential AC line photos: Take 1 or 2 photos from the proposed site plot that show as well as possible the ground surface between the site and the AC power source (ensure that any potentially difficult terrain between the two is shown). Use the following file naming convention postfix:

…**AC_aaa.JPG**

AC_ indicates an AC power source photo looking from the proposed site plot
aaa = direction (azimuth), referenced to true north, toward which photo was taken to the nearest degree

B.4.10.3 Ground cover photos: Step back 30 feet or more from the proposed site plot and take close-up shots of the site location showing ground cover toward several points of the compass (0, 90, 180, and 270 degrees). Use the following file naming convention postfix:

…**SG_aaa.JPG**

SG_ indicates a site ground cover photo looking toward the proposed site plot
aaa = direction (azimuth), referenced to true north, toward which photo was taken to the nearest degree

B.5 SITE DESCRIPTION

B.5.2 Describe Terrain: This box is used for a general description of the terrain in all compass directions. Describe the terrain within a 300- to 600-meter radius of the site and the terrain beyond that to a radius of a few miles in separate paragraphs. If the terrain varies in different compass directions, list separate descriptions for each direction and list the directions to which each description applies. If the terrain is the same in all directions, note that the description applies to all compass directions. Include information on the direction and distance to the nearest town, but it is not necessary to describe specific obstacles, which will be documented in the Site Obstructions Drawing.

B.5.3 SITE OBSTRUCTIONS DRAWING: Draw each obstruction within 100 meters (330 feet) of the center of the plot, label its bearing from the center of the plot in degrees relative to true north, its angular height, and its distance from the center of the plot in meters below. The center of the circle indicates the center of the plot and the edge of the circle represents the extent of the 100-meter range. Each range ring indicates 25 meters (82.5 ft.). In addition, label the locations of other significant terrain features that could affect instrument measurements, such as roads, parking lots, concrete slabs, and bodies of water. To submit the obstructions drawing, scan the completed drawing at 300 dpi in grayscale mode and save it in JPEG format. Use the following naming convention postfix for the scanned image:

…**OD.JPG**

OD indicates the site obstructions drawing

C. Site scoring

The worksheet is used for scoring the site and the four primary elements to be observed. The siting and exposure for each site must be scored for each of the four elements: Temperature, Precipitation, Winds, and Soil Moisture. The tables below describe an objective scoring technique for scoring the sites being surveyed. This is a fundamental component of the site surveys.

There is no question that the survey process requires judgment, skill, and experience and hence a good measure of subjectivity. The intention here is to attempt to objectivize, insofar as possible, the survey process. A successful scoring schema has several important advantages:

- serves as a cross check of the subjective ratings,
- greatly assists metadata analysis in subsequent years, and
- could serve as a "tie-breaker" for competing Class 1 or White sites.

C.1 General Considerations

- Temperature and Precipitation elements are given the most weight, in that these are the primary parameters.

- Precipitation is given slightly less weight than temperature since satisfaction of all Class 1 "White" or 2 "Green" temperature criteria is very positive for precipitation as well.

- Angular measurements are used wherever possible. Figure 1 below shows distance-height ratios. The distance height-ratios have merely been converted to angles as a check on distance estimates in the field.

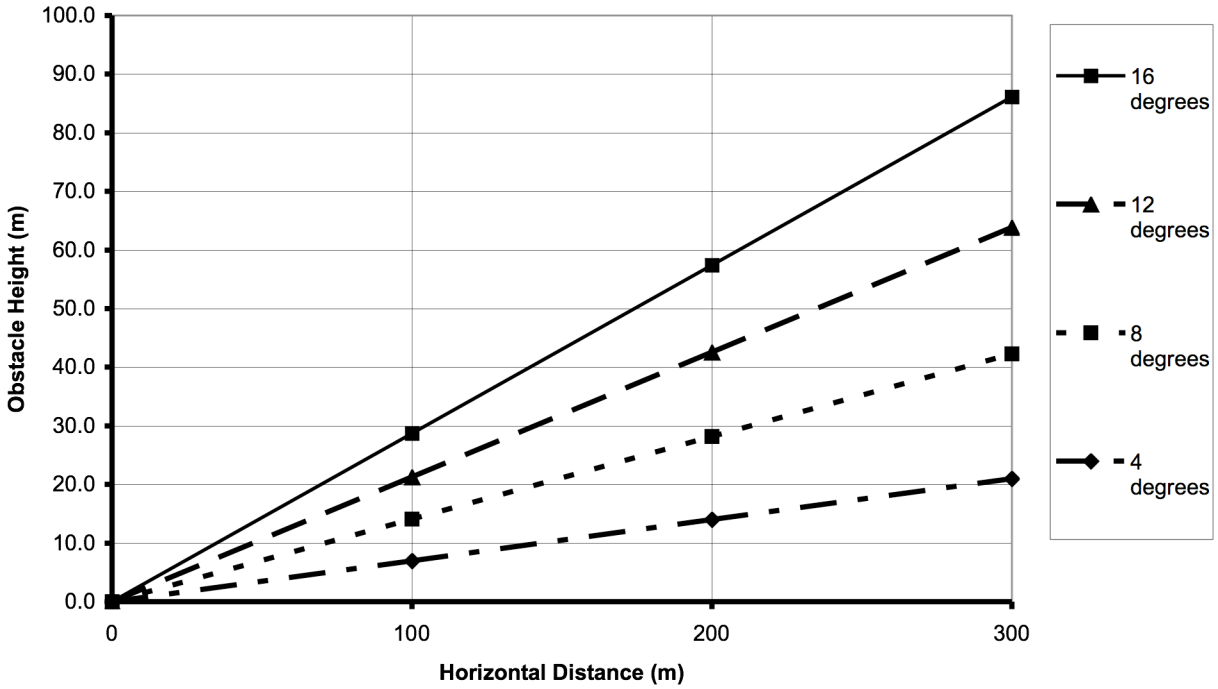


Figure 1. Obstacle height versus horizontal distance for angular heights of 4, 8, 12, and 16 degrees.

C.2 SCORING WORKSHEET: The scoring worksheet is intended to be convenient to use. You should enter the points relevant to the rated criteria in the "Surveyor Score" column.

Temperature & Humidity Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Distance from artificial heating sources and reflective surfaces (m)	≥ 300	14 pts	≥ 240 < 300	12 pts	≥ 100 < 240	8 pts	≥ 50 < 100	5 pts	< 50 *	0 pts	C.2.1
Distance to large bodies of water (m) (When location near water is not representative of the area)	≥ 300	12 pts	≥ 240 < 300	9 pts	≥ 100 < 240	7 pts	≥ 50 < 100	5 pts	< 50 *	0 pts	C.2.1
Angular height of surrounding vegetation within 100 m radius (80% or more coverage is below the angle specified)	< 5°	8 pts	> 5° ≤6°	6 pts	> 6° < 11°	3 pts	> 11° *	0 pts	*	0 pts	C.2.3
Slope of cleared, flat ground surface within 30 m radius	≤ 8º	6 pts	> 8 º ≤ 15 º	3 pts	> 15º ≤ 23º	2 pts	> 23° *	0 pts	*	0 pts	C.2.4

Precipitation Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Angular height of nearest obstacle with angular width > 10 deg	14°	30 pts	27°	20 pts	45°	10 pts	*	0 pts	*	0 pts	C.2.5

Wind Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Angular height of nearest "significant" obstacle (angular width >10º)	≤ 6°	7 pts	> 6° ≤ 8°	4 pts	> 8° ≤ 11°	2 pts	> 11° *	0 pts	*	0 pts	C.2.6
Angular width of nearest "thin" obstacle (angular width <10 deg.)	4°	4 pts	5°	3 pts	6°	1 pt	> 6°	0 pts	*	0 pts	C.2.7
Surrounding terrain greatest relief change (angular change)	< 1°	4 pts	≥ 1° < 3°	3 pts	≥ 3° < 6°	2 pts	≥ 6°	1 pts	*	0 pts	C.2.8

Soil Temp/Moisture Classification/Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Slope of cleared, flat ground surface within 30 m radius	≤ 8º	5 pts	> 8º ≤ 15º	4 pts	> 15º ≤ 23°	2 pts	> 23° *	1 pt	*	0 pts	C.2.9
Basic soil characteristics within 100 m radius	Deep top soil	6 pts	Shallow top soil	5 pts	---	---	A few rocks	1 pt	Rocky ground	0 pts	C.2.10
Ground vegetative cover within 100 m radius	Fully thatched (0% ground bare)	4 pts	Thick vegetation (< 25% ground bare)	3 pts	Moderate vegetation (>25% and <50% ground bare)	2 pts	Sparse vegetation (> 50% ground bare)	1 pt	Ground Bare	0 pts	C.2.11

C.3 OBSERVATIONS ELEMENTS OBJECTIVE NUMERIC SCORE/CLASS: Add the points for each element from the "Surveyor Score" columns in C.2 and convert each score to a class using Table C.3.6. Finally, add all element scores to determine the site objective total score (C.3.5.1) and enter the site objective total class (C.3.5.2).

C.3.6 OBJECTIVE CLASS SCORE TABLE

CLASS	TEMP/RH POINTS	PRECIP POINTS	WIND POINTS	SOIL TEMP/ SOIL MOISTURE POINTS	TOTAL POINTS
WHITE (1)	35-40 POINTS	25-30	13-15	13-15	85-100
GREEN (2)	30-34 POINTS	20-24	10-12	8-12	65-84
BLUE (3)	20-29 POINTS	10-19	5-9	5-7	40-64
YELLOW (4)	10-19 POINTS	UNACCEPTABLE	1-4	UNACCEPTABLE	11-39
RED (5)	UNACCEPTABLE	UNACCEPTABLE	UNACCEPTABLE	UNACCEPTABLE	0-10

C.4 MEASUREMENTS OF REPRESENTIVENESS FOR EACH INSTRUMENT: Provide a final classification based on the objective scores in sections C.1 through C.3 and other subjective analysis collected through site photographs and other information (see the Local Site Representativity Evaluation section near the beginning of this document for guidance). If the classification in section C.4 differs from the classification in C.3, explain the variance in the applicable explanation box. The remarks section should be used for other amplifying information.

E. Practical Site Preparation Information Needed

It is recognized that the surveyors may not be able to answer all of these questions. If the answer is not known please provide a response of "unknown". The WFO/state climatologist in whose CWA/state the site resides may be requested to conduct follow-on activities, or other of NOAA's partners may be required to conduct follow-up prior to any installation activities at a site. A National Environmental Protection Act (NEPA) self-survey form is attached to the survey. This form must be completed to the best of the surveyor's ability.

E.1 Permits may be needed for: installation of meters for power, trenches for power line from meter to tower location, installation of underground cable, excavation for concrete pads for tower and precipitation gauge(s), pouring concrete, building a fence, etc. There could be union regulations precluding some work from being performed by Site Preparation and Installation Team members.

E.2.9 – E.2.10 NEPA Form: The NEPA form information will not be submitted electronically. Instead, the original paper copy of the NEPA form should be mailed to:

NWS ISOS Program Office
3200 Marshall Ave., Suite 180
Norman, OK 73072

Electronic Submission of Survey Metadata Form Data

Survey data must be submitted electronically to the NERON FTP site within 5 business days of each survey, using the NERON Site Survey Metadata Spreadsheet. Create a new directory, named with the site ID, inside the "submitted_forms" directory in the directory corresponding to the state in which the site is located for each survey. Use the following file naming convention:

S_sitidyyyymmddMD.XLS

S_ indicates a survey file
sitid = site ID or pseudo name
yyyy = year survey conducted
mm = month survey conducted
dd = day survey conducted
MD indicates that the file contains the survey metadata

Definitions

Instrument Site – The physical piece of property (lat/long/elev) where an instrument suite is installed.

Instrument Suite – Sensors and other supporting equipment and structures located at one site that are necessary to measure, record, process, store, and transmit observational data.

Sensor – A device that measures an environmental parameter (e.g., air temperature, precipitation, wind speed and direction and character, soil moisture, and others).

Support Equipment – All non-sensor equipment that is part of the instrument suite (e.g., wind shield, batteries and charger, data logger, communications transmitter, tower, and other items).

References

National Research Council (NRC), 1999: *Adequacy of Climate Observing Systems,* National Academy Press, D.C.

Leroy, M., 1998: Meteorological Measurements Representativity, Nearby Obstacles Influence. *10 Symp. On Met. Observ. & Instr.*, 233-236.

WMO (World Meteorological Organization), 1996: *Doc 8, Guide to Instruments and Methods of Observation*, Geneva, Switzerland.

Johnson D.L., 2004: *Program Development Plan, Building the National Cooperative Mesonet*, Coop Modernization, National Weather Service.

Appendix

The following is the paper-based NERON Site Survey Metadata Form, to be used by surveyors to record all required information while performing surveys on-site.

Form Date: 20050608

NERON SITE SURVEY METADATA FORM

A. SITE PHYSICAL LOCATION AND CONTACT INFORMATION

A.1 SITE TYPE (check all that apply): ☐ LEGACY COOP SITE? ☐ EXISTING HCN SITE? ☐ NOAA PARTNER SITE? ☐ NEW SITE?	**A.2** DATE/TIME (UTC)	GRID NUMBER

A.3 SITE ID	**A.4** SITE NAME	**A.5** IF NOAA PARTNER, WHICH ORGANIZATION?

A.6 SURVEYOR INFORMATION

A.6.1 PRIMARY SURVEYOR NAME	**A.6.2** PRIMARY SURVEYOR AFFILIATION

A.6.3 PRIMARY SURVEYOR PHONE	**A.6.4** PRIMARY SURVEYOR EMAIL

A.6.5 OTHER SURVEYOR NAME(S)

A.7 SITE LOCATION INFORMATION

A.7.1 STREET ADDRESS	**A.7.2** CITY	
A.7.3 COUNTY	**A.7.4** STATE	**A.7.5** ZIP

A.7.6 LATITUDE (DECIMAL DEGREES TO 5 DECIMALS, **DO NOT CONVERT FROM MIN:SEC TO DECIMAL DEGREES**)	**A.7.7** LONGITUDE (DECIMAL DEGREES TO 5 DECIMALS, **DO NOT CONVERT FROM MIN:SEC TO DECIMAL DEGREES**)	**A.7.8** ELEVATION (ft MSL; use minus sign if below sea level)

A.7.9 LAT/LON SOURCE (BRAND/MODEL)	**A.7.10** ELEV SOURCE (BRAND/MODEL OR TYPE)	**A.7.11** HORIZ COORDINATE REF DATUM	**A.7.12** VERT COORDINATE REF DATUM

A.7.13 WFO CWA ID	**A.7.14** TYPE OF SITE (national park, family residence, city water plant, university grounds, farm, state DOT facility, etc.)

A.8 SITE CONTACT INFO

A.8.1 NAME	**A.8.2** TYPE
A.8.3 ADDRESS	**A.8.4** CITY

A.8.5 COUNTY	**A.8.6** STATE	**A.8.7** ZIP

A.8.8 PHONE	**A.8.9** FAX

A.8.10 EMAIL

A.9 SITE HOST INFO (if different from site contact)

A.9.1 NAME	**A. 9.2** TYPE	
A.9.3 ADDRESS	**A.9.4** CITY	
A.9.5 COUNTY	**A.9.6** STATE	**A.9.7** ZIP
A.9.8 PHONE	**A.9.9** FAX	
A.9.10 EMAIL		

A.10 Types of other observing sites in vicinity including names and distance (CRN, ASOS, legacy COOP, NERON partner mesonets, USGS, AWOS, FAA, public or private mesonet; if unknown, state "unknown"):

A.11 REMARKS

B. PHYSICAL SITE ASPECTS AND PHOTOS:

Naming conventions are included in the NERON Site Survey Instructions document and <u>MUST</u> be followed prior to uploading photos. If naming convention is not followed or all mandatory pictures are not uploaded to the NERON web site as soon as possible (encourage upload no more than 5 days after the survey completion), the <u>SURVEY is INVALID</u>.

B.1 Appointment made with host? Y N

B.2 Pre-survey preparation complete? Y N

B.3 SITE PHOTOS

B.3.1 MANDATORY PHOTOS

B.3.1.1 Site outward-looking photos taken? Y N

Optional: record photo number in appropriate box

SO_N (toward N)	SO_NE (toward NE)	SO_E (toward E)	SO_SE (toward SE)
SO_S (toward S)	SO_SW (toward SW)	SO_W (toward W)	SO_NW (toward NW)

B.3.1.2 Site inward-looking photos taken? Y N

Optional: record photo number in appropriate box

SI_N (toward N)	SI_E (toward E)	SI_S (toward S)	SI_W (toward W)

B.3.1.3 Site downward photo taken? Y N

Optional: record photo number(s) in box below

SD (toward S)

B.3.1.4 Mandatory site photos uploaded? Y N

B.3.2 CONDITIONAL PHOTOS

B.3.2.1 Obstruction photos taken? Y N

Optional: record photo number(s) in box below

OB_aaa (toward direction)

B.3.2.2 Potential AC line photos taken? Y N

Optional: record photo number(s) in box below

AC_aaa (toward direction)

B.3.2.3 Ground cover photos taken? Y N

Optional: record photo number(s) in box below

SG_aaa (toward direction)

B.3.2.4 Conditional photos uploaded? Y N

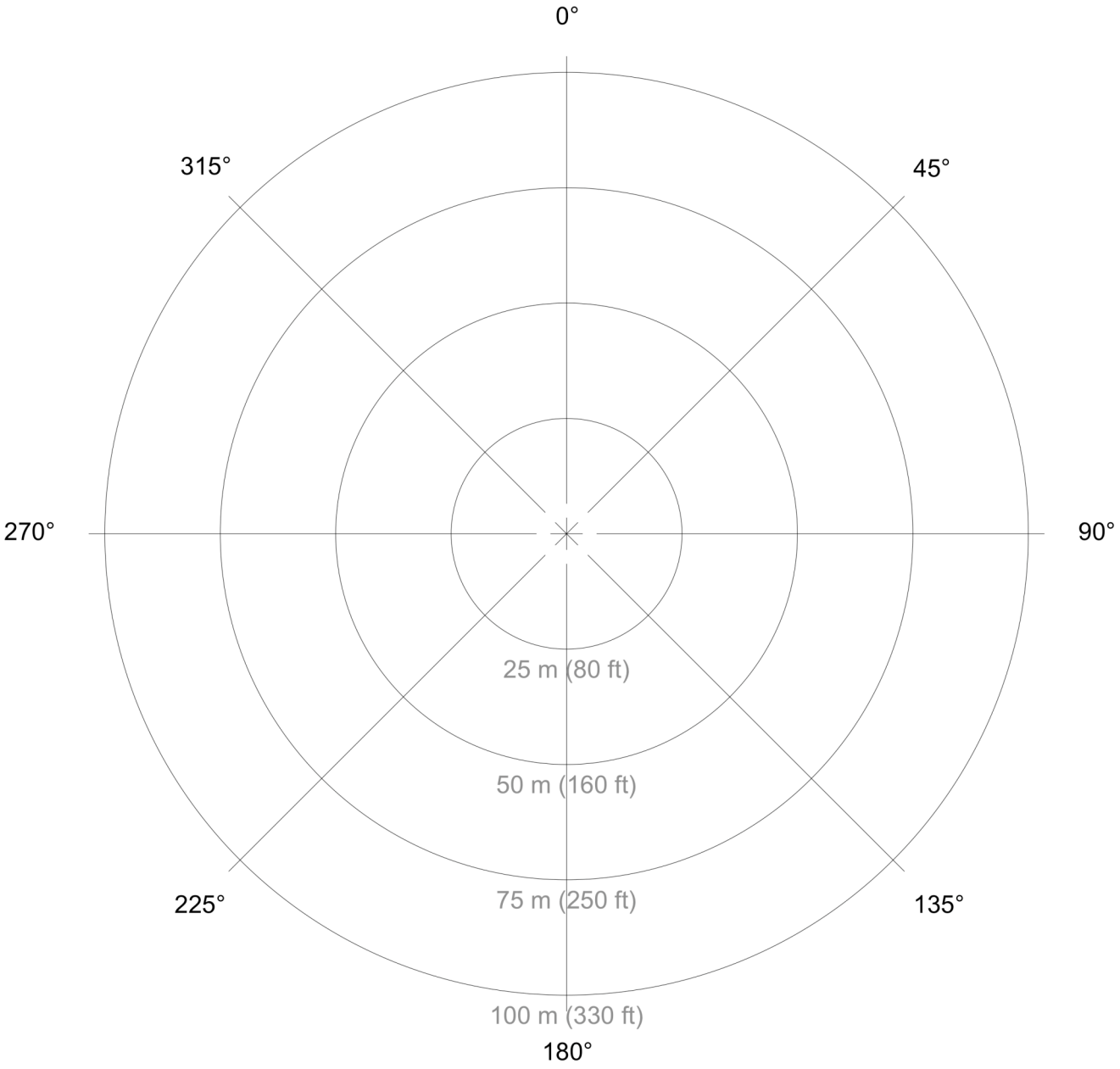
B.4 SITE DESCRIPTION

B.4.1 Describe the use of the property and surrounding area (i.e., pasture land used for grazing, grow wheat/barley/soy which is cut once/twice a year, tilled fields, etc.):

B.4.2 Describe terrain (360 degrees) - long distance (miles) and nearer (~300-600 meters) (i.e., rolling hills, steep escarpments, relatively flat, distance/direction to nearest town and size of town, etc.):

B.4.3 SITE OBSTRUCTION DRAWING

(Use only **BLACK INK** to facilitate scanning)
Draw each obstruction within 100 meters (330 feet) of the center of the plot, label its bearing from the center of the plot in degrees relative to true north, its angular height, and its distance from the center of the plot in meters below. The center of the circle below indicates the center of the plot and the edge of the circle represents the extent of the 100-meter range. Each range ring indicates 25 meters (82.5 ft.). In addition, label the locations of other significant terrain features that could affect instrument measurements, such as roads, parking lots, concrete slabs, and bodies of water.



C. SITE SCORING

C.2 SCORING WORKSHEET

Temperature & Humidity Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Distance from artificial heating sources and reflective surfaces (m)	≥ 300	14 pts	≥ 240 < 300	12 pts	≥ 100 < 240	8 pts	≥ 50 < 100	5 pts	< 50 *	0 pts	C.2.1
Distance to large bodies of water (m) (When location near water is not representative of the area)	≥ 300	12 pts	≥ 240 < 300	9 pts	≥ 100 < 240	7 pts	≥ 50 < 100	5 pts	< 50 *	0 pts	C.2.2
Angular height of surrounding vegetation within 100 m radius (80% or more coverage is below the angle specified)	< 5°	8 pts	> 5° ≤6°	6 pts	> 6° < 11°	3 pts	> 11° *	0 pts	*	0 pts	C.2.3
Slope of cleared, flat ground surface within 30 m radius	≤ 8º	6 pts	> 8 º ≤ 15 º	3 pts	> 15º ≤ 23º	2 pts	> 23° *	0 pts	*	0 pts	C.2.4

Precipitation Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Angular height of nearest obstacle with angular width > 10 deg	14°	30 pts	27°	20 pts	45°	10 pts	*	0 pts	*	0 pts	C.2.5

Wind Classification / Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Angular height of nearest "significant" obstacle (angular width >10º)	≤ 6°	7 pts	> 6° ≤ 8°	4 pts	> 8° ≤ 11°	2 pts	> 11° *	0 pts	*	0 pts	C.2.6
Angular width of nearest "thin" obstacle (angular width <10 deg.)	4°	4 pts	5°	3 pts	6°	1 pt	> 6°	0 pts	*	0 pts	C.2.7
Surrounding terrain greatest relief change (angular change)	< 1°	4 pts	≥ 1° < 3°	3 pts	≥ 3° < 6°	2 pts	≥ 6°	1 pts	*	0 pts	C.2.8

Soil Temp/Moisture Classification/Classification Number	1 (White)		2 (Green)		3 (Blue)		4 (Yellow)		5 (Red)		Surveyor Score
Slope of cleared, flat ground surface within 30 m radius	≤ 8º	5 pts	> 8º ≤ 15º	4 pts	> 15º ≤ 23°	2 pts	> 23° *	1 pt	*	0 pts	C.2.9
Basic soil characteristics within 100 m radius	Deep top soil	6 pts	Shallow top soil	5 pts	---	---	A few rocks	1 pt	Rocky ground	0 pts	C.2.10
Ground vegetative cover within 100 m radius	Fully thatched (0% ground bare)	4 pts	Thick vegetation (< 25% ground bare)	3 pts	Moderate vegetation (>25% and <50% ground bare)	2 pts	Sparse vegetation (> 50% ground bare)	1 pt	Ground Bare	0 pts	C.2.11

C.3 OBSERVATION ELEMENTS OBJECTIVE NUMERIC SCORE/CLASS

VARIABLE	NUMERIC SCORE	CLASS
C.3.1 TEMPERATURE/RELATIVE HUMIDITY	**C.3.1.1**	**C.3.1.2**
C.3.2 PRECIPITATION	**C.3.2.1**	**C.3.2.2**
C.3.3 10 M WIND SPEED AND DIRECTION	**C.3.3.1**	**C.3.3.2**
C.3.4 SOIL TEMPERATURE/ SOIL MOISTURE	**C.3.4.1**	**C.3.4.2**
C.3.5 SITE OBJECTIVE (TOTAL)	**C.3.5.1**	**C.3.5.2**

C.3.6 OBJECTIVE CLASS SCORE TABLE

CLASS	TEMP/RH POINTS	PRECIP POINTS	WIND POINTS	SOIL TEMP/ SOIL MOISTURE POINTS	TOTAL POINTS
WHITE (1)	35-40 POINTS	25-30	13-15	13-15	85-100
GREEN (2)	30-34 POINTS	20-24	10-12	8-12	65-84
BLUE (3)	20-29 POINTS	10-19	5-9	5-7	40-64
YELLOW (4)	10-19 POINTS	UNACCEPTABLE	1-4	UNACCEPTABLE	11-39
RED (5)	UNACCEPTABLE	UNACCEPTABLE	UNACCEPTABLE	UNACCEPTABLE	0-10

C.4 MEASUREMENTS OF REPRESENTATIVENESS FOR EACH INSTRUMENT

C.4.1 TEMPERATURE: WHITE 1 GREEN 2 BLUE 3 YELLOW 4 RED 5

C.4.2 Explain:

C.4.3 PRECIPITATION: WHITE 1 GREEN 2 BLUE 3 YELLOW 4 RED 5

C.4.4 Explain:

C.4.5 WIND SPEED AND DIRECTION:

WHITE	GREEN	BLUE	YELLOW	RED
1	2	3	4	5

C.4.6 Explain:

C.4.7 SOIL TEMPERATURE/ SOIL MOISTURE

WHITE	GREEN	BLUE	YELLOW	RED
1	2	3	4	5

C.4.8 Explain:

C.5 OVERALL CLASS SCORE:

WHITE	GREEN	BLUE	YELLOW	RED
1	2	3	4	5

C.6 OVERALL NUMERIC SCORE: _____

C.7 OTHER SCORING COMMENTS:

D. SITE TECHNICAL INFORMATION

D.1.1 Is AC power available within approximately 300 ft? Y N

D.1.2 If yes, document direction, distance, and intervening terrain between tower and AC power source, include photos, type soil, rocks, etc. that will impact trenching AC line.

D.2 HOST QUESTIONS:

D.2.1 Are there any recurring weather phenomena affecting this site? Y N

D.2.2 If yes, explain:

D.2.3 Is this site likely to be in place without having to be moved for the forecastable future?(long term stability of site)? Y N

D.2.4 Is the host/contact aware of long term plans for the surrounding area? Y N

D.2.5 Is there active tilling of fields within 500 yards of the site? Y N

D.2.6 Is there active irrigation of fields within 500 yards of the site? Y N

D.2.7 Is a fence required? Y N

D.2.8 Will the host augment manual data? (snowfall/snowdepth/river stage, etc.)? Y N

D.2.9 Is there internet connectivity and a computer at the host location where the host could enter manual data? Y N

D.2.10 Would the host be able to use a PC or PDA to augment data directly? Y N

D.2.11 What is the size of the available site? (10X16, 16X20, 20X40, etc.) _____ft x _____ft

D.2.12 Will the host allow the survey team to stake out the site so it can be easily identified by the installation team? Y N

D.2.13 Would host allow a 33-ft tower for a wind sensor some day? Y N

D.2.14 If yes, would the host allow guy wires to support the tower? Y N

D.2.15 Are there underground cables/obstructions in the vicinity of the site? Y N

D.2.16 Is the site in a flood plain? Y N

D.2.17 WATER TABLE LEVEL	**D.2.18** FROST ZONE DEPTH

D.2.19 Discuss local level of general routine support available (in any) – i.e., periodic visual inspection/security visit, general maintenance (mowing, removing branches/debris, and periodically emptying rain gauge, etc.).

D.2.20 Badges or passes needed for installation team? Y N

D.2.21 If yes, badge contact information:

D.2.21.1 CONTACT			
D.2.21.2 ADDRESS			
D.2.21.3 CITY		**D.2.21.4** STATE	**D.2.21.5** ZIP
D.2.21.6 PHONE	**D.2.21.7** FAX	**D.2.21.8** EMAIL	

E. PRACTICAL SITE PREPARATION INFO NEEDED:

E.1 Permits may be needed for installation of meters for power, trenches for power line from meter to tower location, install underground cable, excavation for concrete pads for tower and precip gauge(s), pouring concrete, building fence, etc. there could be union regulations precluding some work from being performed by site preparation and installation team members.

E.1.1 Permits required? Y N

E.1.2 If yes, explain:

E.2 OTHER USEFUL INFORMATION

E.2.1 How close can trucks/vehicles get to site for delivery of site equipment /instruments and building materials (installation crew, deliveries, maintenance, etc.)? ____ ft

E.2.2 List any site access restrictions that will be in place below:

E.2.3 Vehicle Access: □ 2WD □ 4WD □ NEITHER

E.2.4 Vehicle Access throughout the year? Y N

E.2.5 If no, explain below:

E.2.6 Does the site host prefer not to have vehicles driven off-road under certain conditions or have any restrictions on the route that is driven to the site on the host's land? Y N

E.2.7 If yes, explain below:

E.2.8 Site driving directions: (From the intersection of two US/state highways or from an interstate highway exit to the site)

E.2.9 NEPA SURVEY FORM COMPLETED? Y N	**E.2.10** ANY UNRESOLVED NEPA ISSUES OF CONCERN? Y N

F. MISC. NOTES

NOAA Environmental Checklist for Proposed Actions

Date:

Name: NWS COOP Modernization Project

Site Information: (Longitude/Latitude in decimal degrees to 5 places to right of decimal)
Station Name: _____
County/Parish: _____ State: _____
Station Longitude: _____ Station Latitude: _____
Station Elevation: _____ Elevation Source: _____

Detailed Project Description:

This project consists of site preparation and weather/climate monitoring instrument installation. The site will encompass approximately a 24x24 square foot area of land, which generally will not be fenced, on which a suite of weather monitoring instruments will be installed. An approximately 10 feet height tower will be installed, and a precipitation gauge. The remaining area in the plot will retain the original ground cover. Where possible, AC power to the site will be via underground cable with the burial depth dependent on local code requirements. Permits may be required to pull AC power from local lines to the site. Duration of site preparation and installation will not exceed 2 weeks. Following installation, the site will operate automatically with site maintenance frequency dictated by the location and the physical characteristics of each site.

		PRESENT[2]	
CONDITIONS FOR PROPOSED ACTIONS[1]		YES	NO
1.	**Will the proposed action degrade, disturb, or alter threatened or endangered animals or plants or their habitat? If it is not known whether the affected animals or plants are threatened or endangered, check YES.** **Sources: U.S. Fish and Wildlife Service (USFWS) and The Nature Conservancy (TNC)**		
2.	**Will the proposed action degrade or disturb previously undisturbed areas?** **Sources: TNC and visual site inspection**		
2a.	**Will the proposed action degrade or disturb an area that has been severely degraded?** **Sources: TNC and visual site inspection**		

3.	**Will the proposed action affect any areas that normally are inundated by water?** **Sources: U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), and wetlands delineation maps**		
4.	**Will the proposed action create erosion and sedimentation or other types of pollution (for example, wastewater, chemical pollution) that will affect inundated areas?** **Sources: USACE, USGS wetlands delineation maps, county soil conservation office, and county soil survey**		
5.	**Will the proposed action affect other water resources such as surface water or groundwater?** **Sources: USGS wetlands delineation maps, groundwater modeling**		
6.	**Will the proposed action affect areas within the 100-year flood plain?** **Sources: County planning office, flood insurance rate maps (FIRM), USACE**		
7.	**Will the proposed action disturb archaeological resources?** Will the proposed action require any subsurface disturbance? If yes, has the affected area been disturbed previously? If no or unknown, check YES. **Source: State Historic Preservation Officer (SHPO)**		
8.	**Will the proposed action disturb historic resources?** Will the proposed action require the disturbance of any buildings or structures constructed 40 or more years ago? **Sources: SHPO and local historic preservation office**		
9.	**Will the proposed action result (directly or indirectly) in the generation of large amounts of air pollution?** **Sources: Project plans and local or state air regulatory agency**		
9a.	**Will the proposed action require any type of air quality permit?** **Source: Local or state air regulatory agency**		
10.	**Will the proposed action affect any special status areas?** Will the proposed action affect parks, wilderness areas, scenic rivers, or public recreation areas? **Sources: National Park Service and county or city planning office**		
11.	**Will the proposed action require a change in land use or create a conflict with existing land use?** **Sources: County or city planning office or master plan**		
11a.	**Will the proposed action adversely affect the value of adjacent properties?** **Source: County or city planning office**		

12.	**Will the proposed action generate large amounts of hazardous waste or any toxic waste?** **Source: Project plans**		
13.	**Will the proposed action have any effects on human health or safety?** **Sources: Project plans, and state or local department of health**		
13a.	**Will the proposed action emit dangerous levels of ionizing or non-ionizing radiation?** **Source: Project plans**		
14.	**Will the proposed action create high levels of noise for an extended period of time?** **Sources: Equipment manufacturer's information and noise modeling**		
15.	**Will the proposed action have long or short term aesthetic effects?** Will it produce any visual effects or effects on scenery? **Source: Project plans**		
15a.	**Will the proposed action require large amounts of outdoor lighting or create any unusual odors?** **Source: Project plans**		
16.	**Will the proposed action require large amounts of water or electricity for an extended period of time?** **Source: Project plans**		
17.	**Will the proposed action have long- or short-term effects on transportation infrastructure?** Will the proposed action result in a large increase in local traffic? **Source: Project plans**		
17a.	**Will the proposed action require the expansion or upgrading of roads or bridges?** **Source: Project plans and state department of transportation.**		
18.	**Although the effects of the proposed action may not be significant, do those effects add measurably to existing or reasonably foreseeable adverse conditions (resulting from local, state, federal, or private actions)?**		
19.	**Will the proposed action require the disturbance of any suspected or confirmed asbestos containing materials?**		

1 The proposed action being assessed must be fully or partially funded, regulated, conducted, or approved by NOAA.

2 All environmental resource areas for which YES is checked must be addressed in subsections of the "Affected Environment" and "Environmental Consequences" sections of the Environmental Assessment.

If YES was checked for any of the items above, please list the item number, provide additional information about anticipated effects, and contact the NOAA Administrative

Support Center Regional Environmental Compliance Officer as soon as possible.

NOAA Categorical Exclusions

If none of the items on the check list were marked YES, select the applicable categorical exclusion (CX) below. If none apply, of if you have any questions about the applicability of the CX, please contact the NOAA Administrative Support Center Regional Environmental Compliance Officer.

APPLICABLE? YES/NO	CATEGORY	DESCRIPTION
	Research	Programs or projects of limited size and magnitude or with only short-term effects on the environment. Examples include natural resource inventories and environmental monitoring programs. Such projects may be conducted in a wide geographic area without need for an EA or an EIS provided related environmental consequences have a short term effect.
	Financial and Planning Grants	Financial support services and programs, such as federal or state loans or grants where no environmental consequences are anticipated beyond those already analyzed in establishing such programs, laws, or regulations. If no initial analysis was prepared, NOAA would not require preparation of a retroactive environmental document. New financial support services and programs should undergo an environmental analysis at the time of conception to determine if a CX could apply to subsequent actions.
	Minor Planning Activities	Projects where the proposal is for environmental restoration or rehabilitation such as adding picnic facilities to a coastal recreation area unless the project's impacts in conjunction with past, present or reasonably foreseeable future actions could result in a significant impact to the human environment (CEQ sec. 1508.7).
	Pre-proposal Actions	Planning actions before a proposal exists do not require NEPA analysis. A "proposal" exists at that stage in the development of an action when a NOAA organization has a goal and begins its decision-making process, including consideration of environmental impacts, toward realization of that goal (CEQ 1508.23).

	Programmatic Functions	The following NOAA programmatic functions with no potential for significant environmental impacts are generally exempt from the environmental documentation requirements of NEPA: □ Routine experimental procedures □ Program plans and budgets □ Mapping, charting, and surveying services, ship support • Fisheries financial support services □ Basic research or research grants except as provided in section 6.02c.3 of NAO 216-6 □ Enforcement operations, basic environmental services such as weather observations, communications, analyses, and predictions □ Environmental satellite services □ Environmental data and information services □ Air quality observations and analysis □ Support of international global atmospheric and Great Lakes Research programs □ Executive direction □ Administrative services □ Administrative support of the National Advisory Committee on Oceans and Atmosphere and other advisory bodies.
	Regulations Implementing Projects or Plans	When an EA or EIS has been or will be prepared for specific projects or plans serving as the basis for the following activities, implementation of regulations within the scope of the plan and related NEPA documents will receive a CX. Examples include: coastal zone management programs; national estuarine or marine sanctuaries; fishery management plans; and regulations and waivers issued under sec. 101(a)(2), and 101(a)(3) of the Marine Mammal Protection Act (MMPA).
	Permits	Permits for scientific research and public display under the Endangered Species Act (ESA) and MMPA and grants under MMPA.
	Listing Actions Under Sec. 4(a) of ESA	ESA listing, delisting, and reclassifying species and designating critical habitat.
Yes	Others	Other categories of actions which would not have significant environmental impacts, including routine operations, routine maintenance, actions with short-term effects, or actions of limited size or magnitude.